An outline of Late Swifterbant pottery in the Noordoostpolder (province of Flevoland, the Netherlands) and the chronological development of the pottery of the Swifterbant culture

Raemaekers, D.C.M.

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AN OUTLINE OF LATE SWIFTERBANT POTTERY IN THE NOORDOOSTPOLDER (PROVINCE OF FLEVOLAND, THE NETHERLANDS) AND THE CHRONOLOGICAL DEVELOPMENT OF THE POTTERY OF THE SWIFTERBANT CULTURE

D.C.M. RAEMAEKERS
Groningen Institute of Archaeology, Groningen, the Netherlands

ABSTRACT: The centuries after the levee occupation at Swifterbant (4300–4000 BC) and before the start of the TRB West group in the Netherlands around 3400/3300 BC are relatively sparse in terms of archaeological remains. This article presents the available ceramic evidence from the major assemblages. On the basis of this Late Swifterbant material schemes are presented on the chronological development and regional variation of the pottery of the Swifterbant culture.

KEYWORDS: the Netherlands, Noordoostpolder, Middle Neolithic, Swifterbant, ceramics, ^{14}C analysis.

1. INTRODUCTION

In this article Late Swifterbant ceramics are presented. First of all, this is done to complete the overview of the Swifterbant culture I presented earlier (Raemaekers, 1999) and in which the late phase was inevitably underrepresented. The newly available data for the first time allow an overview of Late Swifterbant ceramics. The restricted information on other aspects of material culture, *e.g.* flint artefacts, hinders a synthesis on a more encompassing level. Second, the publications of the sites presented here were internationally hardly (Schokkerhaven) or not at all available (Urk, Emmeloord). This publication aims to bring these sites to the fore. Third, on the basis of the ceramics from the three sites, there is a possibility to present new material to the debate on the transition to TRB. In more general terms, this concerns the positioning of the Late Swifterbant material in relation to other ceramic groups: the middle phase of the Swifterbant culture, earliest TRB and the Hazendonk 3 group. Fourth, this study allows a characterisation of the pottery developments during the fourteen centuries of the Swifterbant culture.

The period under study is relatively easy to define as being the Nagele phase as described by Hogestijn (1990) or Late Swifterbant as defined by Raemaekers (1999). It concerns the centuries between *c*. 3900–3800 BC and the start of the TRB Westgroup around 3400–3300 BC (Lanting & Van der Plicht, 1999/2000).

This article presents the characteristics of the pottery from three sites in the Noordoostpolder, a polder located in the central part of the Netherlands (fig. 1). This region holds virtually all Dutch evidence on the period at hand. This is no coincidence but the result of two favourable circumstances. First of all, like in many other Dutch polders, the Neolithic surface was covered here with later sediments and preserved. Second, in the Noordoostpolder, as in the other polders of the province of Flevoland, archaeological sites were discovered by workers of the Rijksdienst voor de IJsselmeerpolders (RIJP). Their discoveries were the start of the so-called

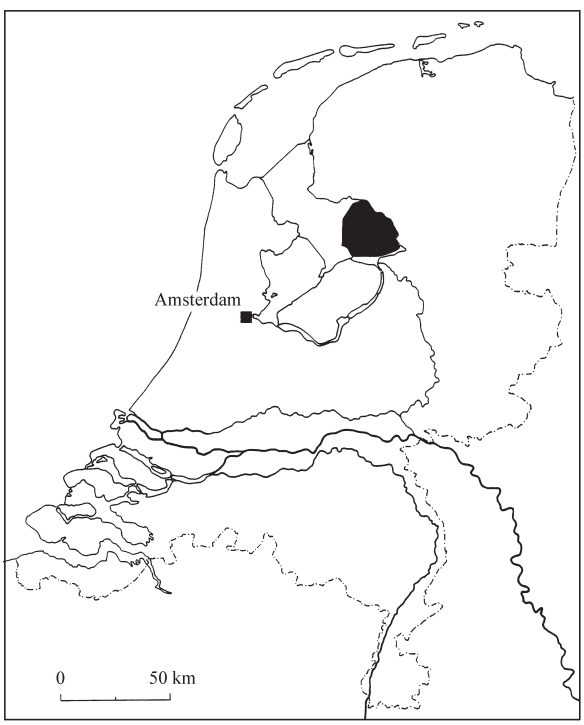

Fig. 1. Map of the Netherlands. In black: the Noordoostpolder.

Fig. 2. Palaeogeographical map of the Noordoostpolder with all known sites from the Swifterbant culture (*c*. 5000–3400 BC). 1= Urk-E4; 2=Emmeloord-J97; 3=Schokkerhaven-E170; 4=P14 (After Gehasse, 1995: map 4).

Wet Centre Project of the University of Amsterdam during the 1980's and early 1990's. This project incorporated further archaeological research into the known sites by means of coring, test trenches and excavation (see sections 4, 5 and 6.1).

The developments in the natural environment during the Holocene were the topic of a Ph.D. research within the Wet Centre Project (Gotjé, 1993). It resulted in a regional curve for the rise of groundwater levels and a series of palaeogeographical maps for the polder. Figure 2 presents the reconstruction for the period 3700–3400 BC. It shows a gradual transition in vegetation types from a mixed deciduous forest in the northeast to sedge-dominated vegetation in the southwest. This landscape is criss-crossed with small streams leading to two major river systems. These systems are the river IJssel in the southernmost part of the polder and the river Vecht running parallel at

a distance of some 5–10 km. All known Swifterbant sites (5000–3400 BC) are indicated as well. The figure makes clear that most sites are located near the waterways.

2. DATING

With ^{14}C dates, one can choose between two problems. The first problem pertains to association. When one dates archaeological remains through associated biological remains such as bone, a charred cereal grain or peat, one should be cautious whether the ^{14}C date does indeed date the archaeological find and not simply the biological remains (bone, grain) or the sediment (peat).[1] This type of dating is used for the site Schokkerhaven-E170 presented below. The problem of association is of little relevance for this site because of the coherent dates (fig. 8) and the relatively small time depth involved.

The second problem may arise when one dates the archaeological find directly. In the case of pottery, this means dating plant temper or charred food remains. The dating of plant temper is not of much relevance here. Although it was successful for Swifterbant pottery (Hogestijn & Peeters, 1996: table 1), it is dependent on the presence of plant temper. In the pottery presented here, plant temper is as a rule completely burnt away leaving only the pores as visual reminders of the plant temper. In this study ^{14}C dates on charred food remains are used for the sites Urk-E4[2] and Emmeloord-J97. Problems with this type of ^{14}C dating are related to the reservoir effect. The last decade it has become apparent that ^{14}C dates may be several centuries older than expected. At first, this problem seemed to be restricted to ^{14}C dates based on marine foods. Now it becomes apparent that the reservoir effect may also result in freshwater environments where 'old' carbon leaked into the food chain through photosynthesis (Lanting & Van der Plicht, 1995/1996; Fisher & Heinemeier, 2003). As a result, interpreting ^{14}C dates has become less straightforward than a decade ago.

To determine the reservoir effect of the ^{14}C dates presented here an analysis was first made of the cereal grains from the Netherlands which were dated at the Centre for Isotopic Research of the University of Groningen (Centrum voor Isotopen Onderzoek, CIO). From these 87 dates the δ^{13}C values were collected. This value is a figure that is dependent upon the position of the analysed material within the carbon transport which connects water, soil, plants and animals (*cf.* Lanting & Van der Plicht, 1995/1996). The δ^{13}C values from the cereal grains are used as a bench mark for the charred food remains. If the charred food consisted of pure cereal porridge, similar δ^{13}C values would be expected for the charred remains. Figure 3-top makes clear that the cereal grains have δ^{13}C values between –22.4 and –26.4 ‰.

As a second step in the analysis, an overview was made of all Groningen ^{14}C dates on charred food remains on pottery from the Netherlands (table 1). The quality of these 49 dates was determined on the basis of the c_v value, a figure indicative of the carbon content of the dated sample. Four dates were rejected because of too low carbon content. One Middelstum pot was redated because of the unexpected outcome; the new date is used here. Figure 3-bottom shows the available 44 δ^{13}C values. It makes clear that although most dates have more negative δ^{13}C values than the cereal dates, seven out of the ten dates which are interpreted as having no reservoir effect fall within or near the range of the cereal grain values. This suggests that in these instances we are indeed dealing with porridge. Almost all other δ^{13}C values are more negative than those from the grains. Here we are probably dealing with a fresh water reservoir effect, an interpretation underlined by the four dates from Polderweg and De Bruin and the two dates from Emmeloord that are clearly too old (Lanting & Van der Plicht, 1999/2000: p. 54; Butler, Van der Heijden & Hamburg, 2002). The δ^{13}C values from the Urk and remaining Emmeloord dates also lie inside the range for which a reservoir effect is proposed. It is concluded that all these date are too old.

All dates were calibrated using OxCal 3.9 (Bronk Ramsey, 1995; 2001).

3. URK-E4

3.1. Introduction

The site Urk-E4 was discovered in 1991. In 1997, it was decided to excavate the site because agricultural activities and nearby building activities threatened the site. The excavation was carried out by the Dutch State Service for Archaeological Heritage Management (Rijksdienst voor het Oudheidkundig Bodemonderzoek, ROB). The results of the excavation were published as a so-called standard report edited by Peters and Peeters (2001). The excavation was carried out with a series of different methods. Some trenches were excavated with detail (using trowels), others were excavated by machine. As a result, the

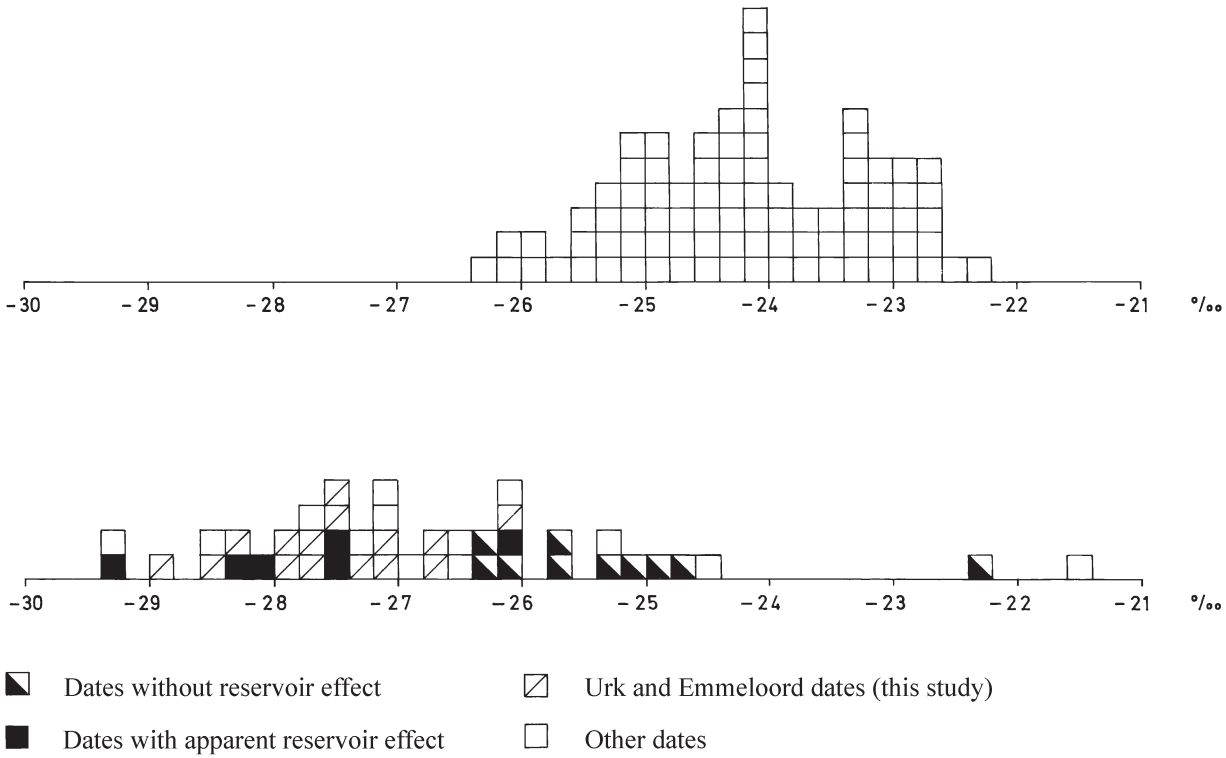

Fig. 3. The δ ^{13}C values from 87 charred cereal grains (top) and 44 charred food remains (bottom), from the Netherlands, western Westphalia and Belgian Limburg. All CIO measurements.

spatial information on the finds is unevenly distributed. There are two areas (a northern and a southern) were spatial information is of relevance. In the central and western part of the site spatial information is too limited to be of use (Peters & Peeters, 2001: fig. 5).

3.2. Site description

The site is located on a river dune, which is part of a series of dunes in the valley of the river Vecht (fig. 2). Although the summit of the dune has been eroded away, the contours of the dune suggest that it reached to *c*. 3.80 m –NAP (Dutch Ordnance Level). During the Holocene, the rise of the groundwater level lead to a gradual drowning of the dune. In this process, the slopes were covered by layers of clay and peat. After *c*. 3700 BC the river Vecht changed course and the river dune became embedded in peat. On the basis of the supposed summit and the regional curve for the rise of groundwater levels (Gotjé, 1993; see above), the youngest dates for human occupation should be expected around 3000 BC (Peters & Peeters, 2001: pp. 17–32).

The occupation of the site can be dated to the Mesolithic and Neolithic on the basis of the character of the archaeological remains and a series of twenty ^{14}C dates. The Mesolithic occupation is attested by the presence of Mesolithic flint and nine ^{14}C dates of charcoal from hearth pits. The Neolithic occupation is of relevance here. The pottery (Verneau, 2001a), flint (Verneau, 2001b) and ^{14}C dates suggest that occupation took place between *c*. 4200 and 3400 BC: the second part of the Middle Phase and the Late Phase of the Swifterbant-culture. The relevant ^{14}C dates are listed in figure 4 and tables 1 and 2. The flint assemblage reflects the Neolithic occupation on the basis of guide fossils. These are leaf-shaped and triangular arrowheads, known from several Swifterbant sites (P14: Wilhelm, 1996; Brandwijk: Raemaekers, 1999). The flint assemblage does not comprise elements attributable to TRB. *Tiefstich* TRB pottery is also absent suggesting that occupation ended before 3400/3300 BC.

Most of the features and organic remains probably belong to the Neolithic although ^{14}C dates to underline this interpretation are near absent. The features include a small number of postholes. At the central part of the site ten human burials were found. The ^{14}C dates of the burials yielded four dates including a date nine centuries younger than the supposed date of drowning of the site. The c_v values for all dates sug-

Table 1. The 49 ^{14}C dates on charred food remains from the Netherlands

Site	Lab number	Date (BP)	$\delta^{13}C$ (‰)	C_v	Publication	Remark
Bleskensgraaf	GrA-6848	1010±50	–26.4	48.5	Unpublished	No reservoir effect
De Bruin	GrA-13318	6100±50	–27.1	63.0	Lanting/Van der Plicht 1999/2000	No reservoir effect
De Bruin	GrA-13317	5880±50	–27.7	65.0	Lanting/Van der Plicht 1999/2000	No reservoir effect
De Bruin	GrA-13313	6090±50	–27.4	56.0	Lanting/Van der Plicht 1999/2000	Too old
De Bruin	GrA-13315	6070±50	–28.2	62.2	Lanting/Van der Plicht 1999/2000	Too old
De Bruin	GrA-13320	5730±50	–29.3	47.8	Lanting/Van der Plicht 1999/2000	No reservoir effect
Emmeloord	GrA-18839	4360±50	–26.1	46.2	Bulten/Van der Heijden/Hamburg 2002	Too old
Emmeloord	GrA-18835	4260±50	–27.5	40.9	Bulten/Van der Heijden/Hamburg 2002	Too old
Emmeloord	GrA-18833	3550±50	–26.0	60.3	Bulten/Van der Heijden/Hamburg 2002	No reservoir effect
Emmeloord	GrA-25981	3725±45	–24.7	52.3	Unpublished	No reservoir effect
Emmeloord-pot 1	GrA-25791	4880±50	–27.4	53.2	This publication	Unknown
Emmeloord-pot 2	GrA-25792	4795±45	–28.3	52.4	This publication	Unknown
Emmeloord-pot 3	GrA-25799	4720±45	–28.4	46.6	This publication	Unknown
Emmeloord-pot 4	GrA-18840	4710±50	–26.7	49.6	This publication	Unknown
Emmeloord-pot 5	GrA-25781	4605±45	–26.1	55.5	This publication	Unknown
Emmeloord-pot 6	GrA-18836	4590±50	–26.6	50.4	This publication	Unknown
Emmeloord-pot 7	GrA-25800	4535±45	–27.5	54.6	This publication	Unknown
Emmeloord-pot 8	GrA-18837	4500±50	–27.7	55.9	This publication	Unknown
Emmen	GrA-17597	3025±40	–25.2	44.3	Ufkes 2001	No reservoir effect
Heerjansdam	GrA-18055	4625±40	–25.2	46.9	Bloo 2002	Unknown
Lienden	GrA-15980	3270±40	–26.2	40.8	Schoneveld et al. 2002	No reservoir effect
Middelstum 13	GrA-27778	2240±40	–25.7	53.3	Lanting/Van der Plicht in prep	No reservoir effect
Middelstum 157	GrA-27779	2215±40	–25.7	53.9	Lanting/Van der Plicht in prep	No reservoir effect
Middelstum 212	GrA-27780	2295±40	–27.3	20.8	Lanting/Van der Plicht in prep	Unreliable date (low carbon content)
Middelstum 331	GrA-27782	2475±35	–24.9	58.9	Lanting/Van der Plicht in prep	No reservoir effect
Middelstum 484	GrA-27783	2785±40	–25.0	49.7	Lanting/Van der Plicht in prep	Deviant date; redated
Middelstum 484	GrA-27784	2460±35	–25.0	47.0	Lanting/Van der Plicht in prep	No reservoir effect
Papendrecht	GrA-8393	2180±50	–24.2	20.2	Dijkstra et al. 1999	Unreliable date (low carbon content)
Polderweg	GrA-11829	6130±50	–29.3	46.4	Lanting/Van der Plicht 1999/2000	Too old
Polderweg	GrA-11841	6140±50	–28.1	51.3	Lanting/Van der Plicht 1999/2000	Too old
Puttershoek	GrA-12299	3920±60	–28.6	7.2	Lanting/Van der Plicht 1999/2000	Unreliable date (low carbon content)
Schipluiden	GrA-26359	5205±40	–26.8	47.5	Mol/Hamburg in prep	Unknown
Schipluiden	GrA-26361	4900±35	–26.0	53.4	Mol/Hamburg in prep	Unknown
Schipluiden	GrA-26362	4985±40	–26.5	40.6	Mol/Hamburg in prep	Unknown
Schipluiden	GrA-26363	5055±40	–21.5	33.6	Mol/Hamburg in prep	Unknown
Schipluiden	GrA-26892	5220±35	–24.4	49.5	Mol/Hamburg in prep	Unknown
Swifterbant-S11	GrA-5402	5400±70	–27.2	51.8	Lanting/Van der Plicht 1999/2000	Unknown
Swifterbant-S23	GrA-4334	5320±120	–29.4	7.9	Lanting/Van der Plicht 1999/2000	Unreliable date (low carbon content)
Urk-pot 1	GrA-25802	5350±45	–27.0	51.2	This publication	Unknown
Urk-pot 2	GrA-25806	5305±45	–27.1	55.8	This publication	Unknown
Urk-pot 3	GrN-25691	5300±30	–27.2	unknown	This publication	Unknown
Urk-pot 4	GrA-25824	5090±50	–27.8	unknown	This publication	Unknown
Urk-pot 5	GrA-25804	5040±50	–28.9	35.5	This publication	Unknown
Urk-pot 6	GrA-25805	4850±70	–27.6	64.4	This publication	Unknown
Urk-pot 7	GrA-25809	4825±45	–27.8	62.5	This publication	Unknown
Wijnaldum	GrA-1531	1470±40	–22.3	55.4	Unpublished	No reservoir effect
IJsselham	GrA-14855	2560±40	–26.5	43.8	Unpublished	Unknown
Zandwerven	GrA-116	4320±60	–27.1	unknown	Lanting/Van der Plicht 1999/2000	Unknown
Zeewolde OZ 35/36	GrN-26612	4660±40	–28.5	63.8	Unpublished	Unknown

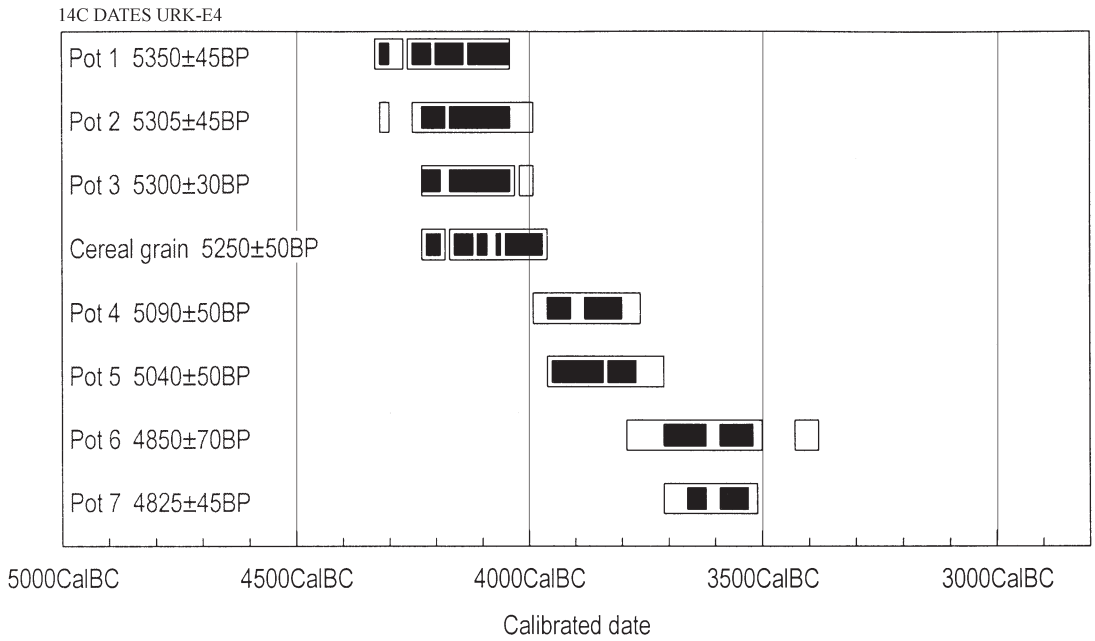

Fig. 4. ^{14}C dates from Urk-E4.

gest that no collagen was dated and it must be concluded that these dates are unreliable (table 2). When one considers the fact that bone remains do not survive centuries of oxidation, one might suppose that the burials date to the latest part of the occupation and may be considered Late Swifterbant. The burial group consisted of nine adults and one child aged between nine and fourteen. The poor preservation made it difficult to determine the sex of the adults, but both sexes were probably present. Four individuals were buried in supine position, one in hocker position and there are two skull burials. Grave seven comprises the partial remains of three individuals and fragments of at least three others. The only grave with grave goods is one of the supine burials which held three amber beads (d'Hollosy & Baetsen, 2001)

In the southern part of the site linear marks were found. These marks have a depth of a few cm, a width of 2–8 cm and a length up to several meters. The marks were studied using thin-sections and pollen analysis in order to determine whether they should be interpreted as plough marks. The thin-section analysis suggested that the surface was cleared of vegetation using fire. The resulting charcoal was mixed with the sand as a result of repeated human interference with the soil (Exaltus cited in Peters & Peeters, 2001). The pollen analysis of the soil from the marks revealed the presence of wheat pollen (*Triticum*) and pollen from ruderal and grassland plants. Both types of analysis might be brought to the fore as arguments for an interpretation of these marks as plough marks (Van Smeerdijk cited in Peter & Peeters, 2001). The botanical analysis revealed that the diet was based on cultivated and gathered plants (Vernimmen, 2001). The cultivated plants are einkorn (*Triticum monococcum*) and emmer wheat (*Triticum dicoccum*).

3.3. Research method

The selection of Late Swifterbant pottery could only be carried out with the aid of ^{14}C dates because stratigraphy is of no help and technological and morphological arguments cannot be used to avoid a circular argument. All sherds were therefore examined in order to select those sherds with food remains and morphological characteristics. Promising sherds were set aside and then a query was made in the available database to search for sherds with (almost) similar characteristics. It was hoped that this might provide fitting sherds to get larger pottery fragments. This second step of the analysis took much time but yielded little result. In total only thirteen fits with sherds from different find numbers were made.

There are two reasons for the disappointing refitting results. First of all, refitting of sherds from settlement sites with sandy subsoil is often unrewarding. Sherds lie on or near the surface for a longer period of time than on sites with clay or peat subsoil. As a result, many sherds weather easily and it is quite common that only a few percent of a pot is preserved

Table 2. The other relevant ^{14}C dates from Urk-E4.

Lab number	Archaeology	Date (BP)	$\delta^{13}C$‰	C_v	Comment
GrA-16947	Cereal grain	5250±50	-25.2	unknown	accepted
GrA-16825	Human bone	4150±50	-27.3	31.2	rejected
GrA-12899	Human bone	7250±100	-28.1	7.9	rejected
GrA-16827	Human bone	5110±50	-27.1	15.3	rejected
GrA-16828	Human bone	4350±50	-26.8	18.5	rejected

at a site. The second reason is tied to the excavation methods at Urk-E4. In a large part of the excavation only the larger fragments were collected. It means that the percentage of a pot that is available for refitting is even lower than for other sandy sites.

3.4. Late Swifterbant pottery

The following pot fragments were selected for ^{14}C dating:

- Urk-pot 1. Beaker with rim diameter of *c.* 21 cm tempered with small quantity of quartz. Strip-building with N-joins;
- Urk-pot 2. Fragment of point-base tempered with large quantity of quartz;
- Urk-pot 3. S-shaped pot with rim diameter of *c.* 25 cm and height of 34 cm. Unavailable for study;
- Urk-pot 4. Shoulder fragment decorated with one series of square spatula impressions tempered with average quantities of red granite and charcoal. The charcoal was isolated and ^{14}C dated;
- Urk-pot 5. Barrel-shaped pot with unfinished repair hole tempered with average quantity of quartz;
- Urk-pot 6. Barrel-shaped pot with rim diameter of *c.* 35 cm tempered with a large quantity of quartz;
- Urk-pot 7. Biconical pot with rim diameter of *c.* 28 cm tempered with a large quantity of quartz.

All pots are depicted in figure 5.

In the case of Urk-E4, a *terminus ante quem* for the occupation is provided by the regional curve for the rise of groundwater levels (Gotjé, 1993).[3] As a matter of fact all dates on charred food remains predate the supposed time of the drowning of the site (fig. 4 and table 1). This leaves us with two groups of dates. The first group, with apparent ages younger than *c.* 3900 BC cannot be younger than 3000 BC because of the covering of the dune around that time. Because the ceramic characteristics clearly differ from Westgroup TRB pottery (pers. comm. A. Brindley), they are considered Late Swifterbant. The second group, with dates older than *c.* 3900 BC might be Late Swifterbant but is left out of further consideration, because it is unknown what the scale of the reservoir effect is. These pots might be Middle or Late Swifterbant.

In other words, only the dates younger than 3900 BC are considered below, *i.e.* pots 6 and 7. The other pots are discussed after defining the general characteristics of Late Swifterbant pots to determine whether they can be attributed on the basis of their technological and/or morphological characteristics.

4. EMMELOORD-J97

4.1. Introduction

The site was discovered in 1950 when a trench between two agricultural fields was re-dug. Sherds, flint artefacts, stone, loam and bone, charcoal and a hazelnut were found in the soil from the trench. The sherds were dated to the Early Bronze Age (2000–1800 BC). In the 1980's a coring campaign resulted in more detailed information on the geological context while trial excavations yielded more remains dating from the Neolithic (Swifterbant?, TRB, Single Grave Culture?, Bell Beaker Culture). In the years 1999–2001 a series of excavations was carried out by the Archeologische Diensten Centrum (ADC; 1999, 2000, 2001) and the province of Flevoland (2000). The results of the excavation were published in a standard report edited by Bulten, Van der Heijden & Hamburg (2002).

4.2. Site description

The site is located within the stream valley of the river Vecht, some 12 km upstream from Urk-E4 (fig. 2). During the Holocene the river valley was gradually filled up with peat. Around 4300–4000 BC a complex network of small creeks and levees developed. From around 3800–3500 BC the creek gradually filled up with sediment. The attested start of the occupation occurred somewhat later: 3650–3350 BC. From around 3350–3000 BC peat developed in the area and the site

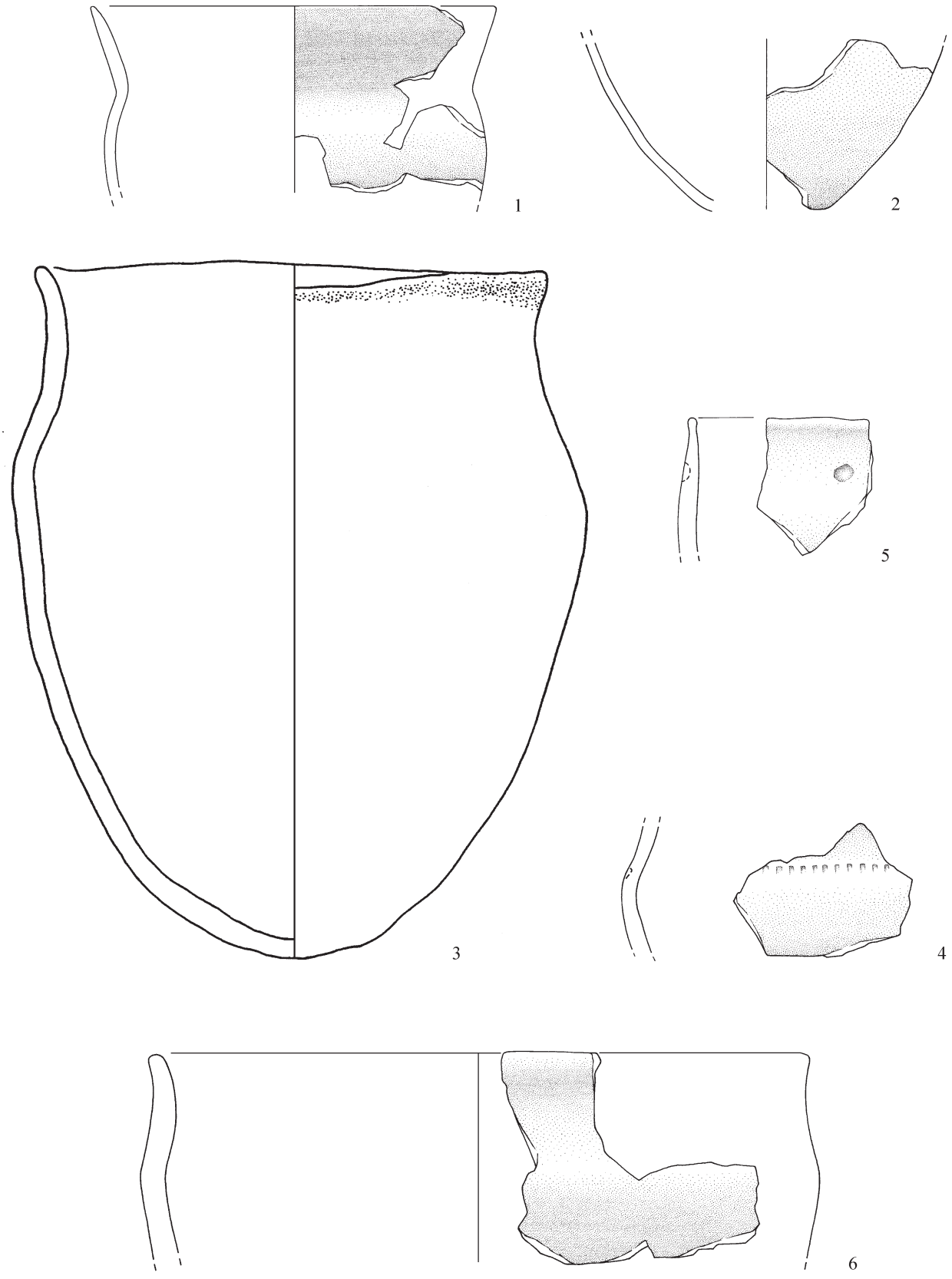

Fig. 5. Pottery from Urk-E4.

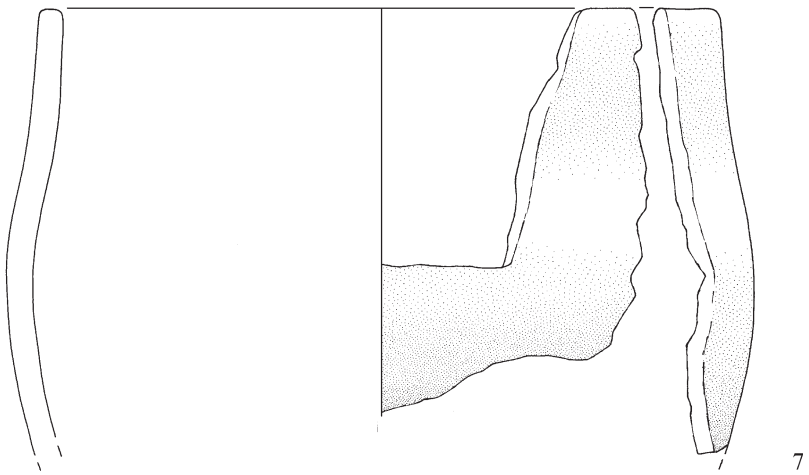

Fig. 5. (*cont*.)

was abandoned around 3000 BC to be re-occupied some 600 years later (Van Zijverden, 2002).

The archaeological remains are found on the levee of the river Vecht and in the fill of the creek. Unfortunately, for most of the finds it is impossible to determine whether they belong to the Neolithic or the Bronze Age occupation phase. The excavation learned that both on the levee and in the creek finds from different periods were found together. In this overview, the finds that may be attributed to the Neolithic are listed. The flint assemblage suggests a Late Swifterbant occupation. One would expect the presence of blades and trapezes for an older (Middle Phase) Swifterbant occupation and these are absent. TRB elements such as transverse arrowheads or axe types are also absent suggesting that the Neolithic occupation is restricted to the Late Swifterbant period (Verneau, 2002). The Neolithic pottery mostly encompasses pottery in Swiftertbant style. There is one *Tiefstich* TRB sherd (Bloo, 2002).

The most spectacular aspect of this site is the large number of fish-weirs and fish-traps. In total ten fish-weirs and 44 fish-traps were found. Three fish-weirs and three fish-traps are dated to *c*. 3400–2900 BC (table 3). Fish-weir 7 consisted of some 70 stakes aligned in a straight line with a length of *c*. 17 m. Number 8 was constructed with *c*. 100 stakes which were aligned in a V-shape. It has a total length of *c*. 15 m. The characteristics of fish-weir 10 are less clear (Van der Heijden & Hamburg, 2002). The fish-weirs are mostly constructed from alder wood (*Alnus*; 66%). Willow (*Salix*; 22%), birch (*Betula*) and oak (*Quercus*) were also used (Van Rijn, 2002).

Table 3. The other relevant ^{14}C dates from Emmeloord-J97.

Lab number	Archaeology	Date (BP)
GrN-26481	Fish-trap 2	4520±30
GrN-19510	Fish-trap 7	4500±70
GrN-26498	Fish-weir 7	4500±20
GrN-26491	Fish-weir 8	4500±40
GrN-26494	Fish-weir 10	4480±20
GrN-26497	Fish-weir 7	4470±20
GrN-26480	Fish-trap 1	4440±40
GrN-26496	Fish-weir 8	4400±20

4.3. Research method

The selection of Late Swifterbant pottery was carried out by A. Kerkhoven. He re-analysed the stratigraphy of the site and concluded that in the lower part of the creek filling (the so-called Unio 2-clay) no younger sherds were found (Kerkhoven, 2003). The small number of pottery sherds from this find context was studied in order to select pot fragments large enough to reconstruct vessel shape and with food remains. These crusts were then ^{14}C dated to verify Kerkhoven's interpretations.

A methodological problem pertaining to this selection is that the limited knowledge on Late Swifterbant pottery may have lead to the dismissal of pots dating from this period as being 'non-Swifterbant'. In other words, the selection may be too small and other Late Swifterbant pots might be found outside the selection.

4.4. Late Swifterbant pottery

The following pot fragments were selected for ^{14}C dating:

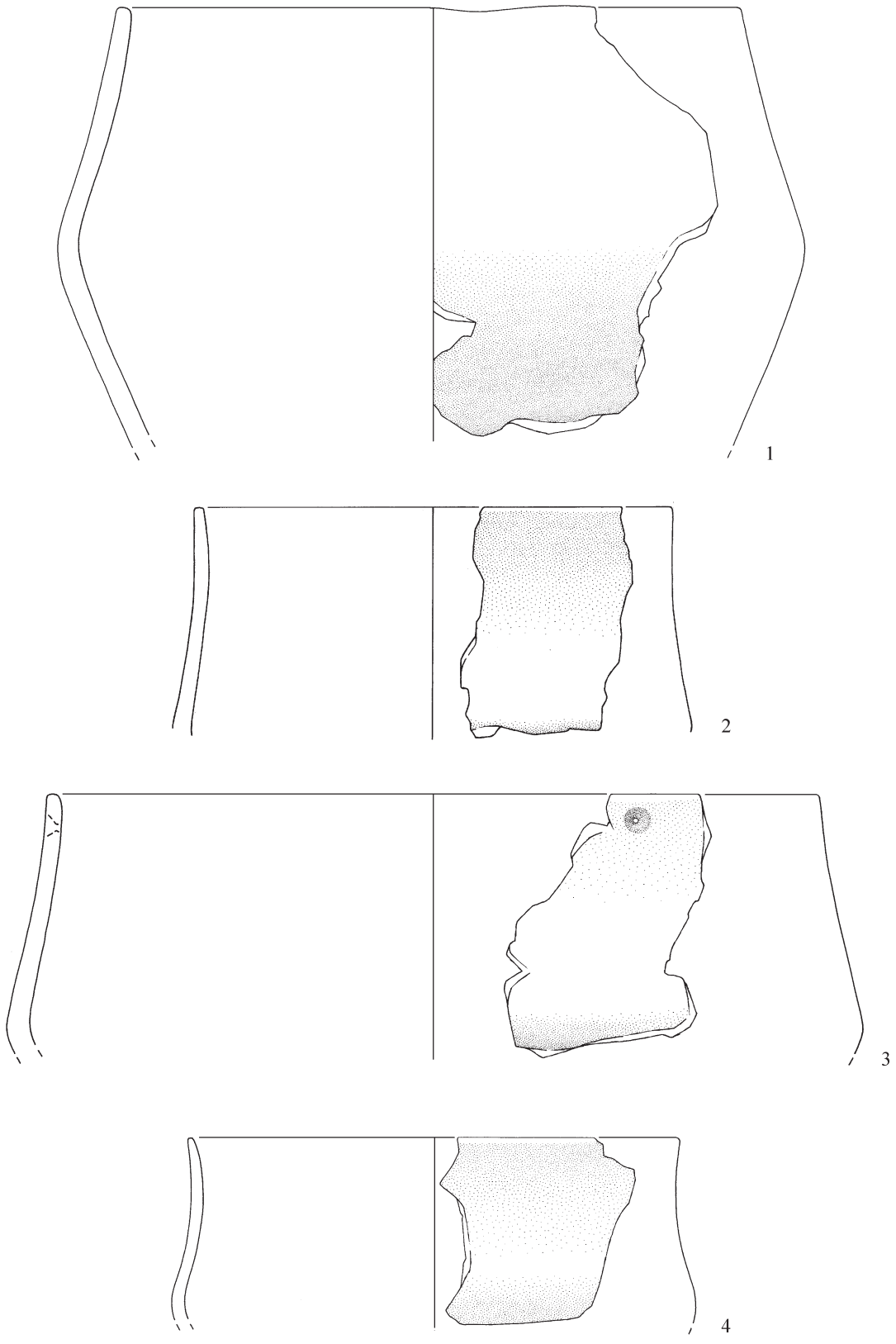

Fig. 6. Pottery from Emmeloord-J97.

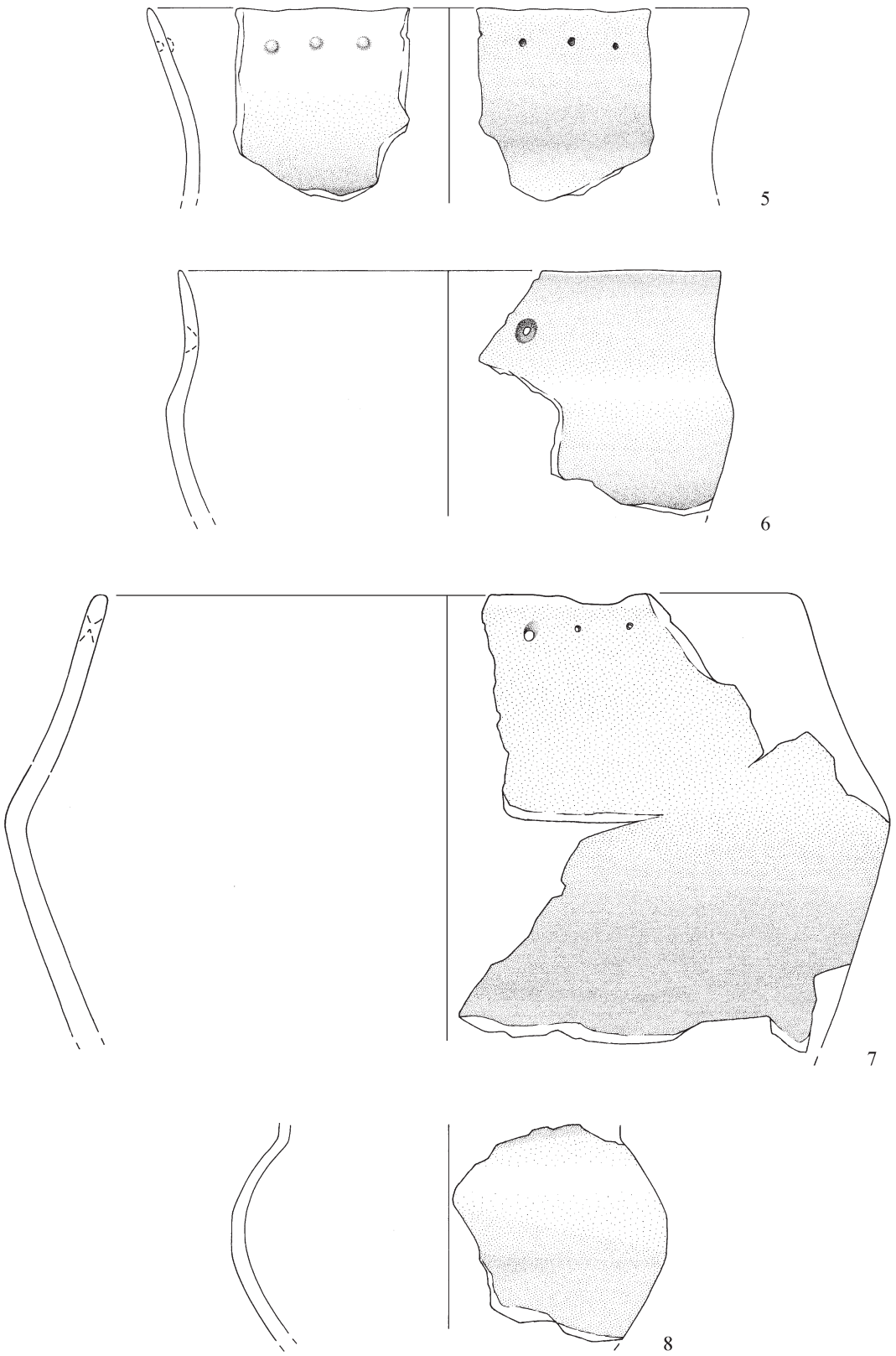

Fig. 6. (*cont.*)

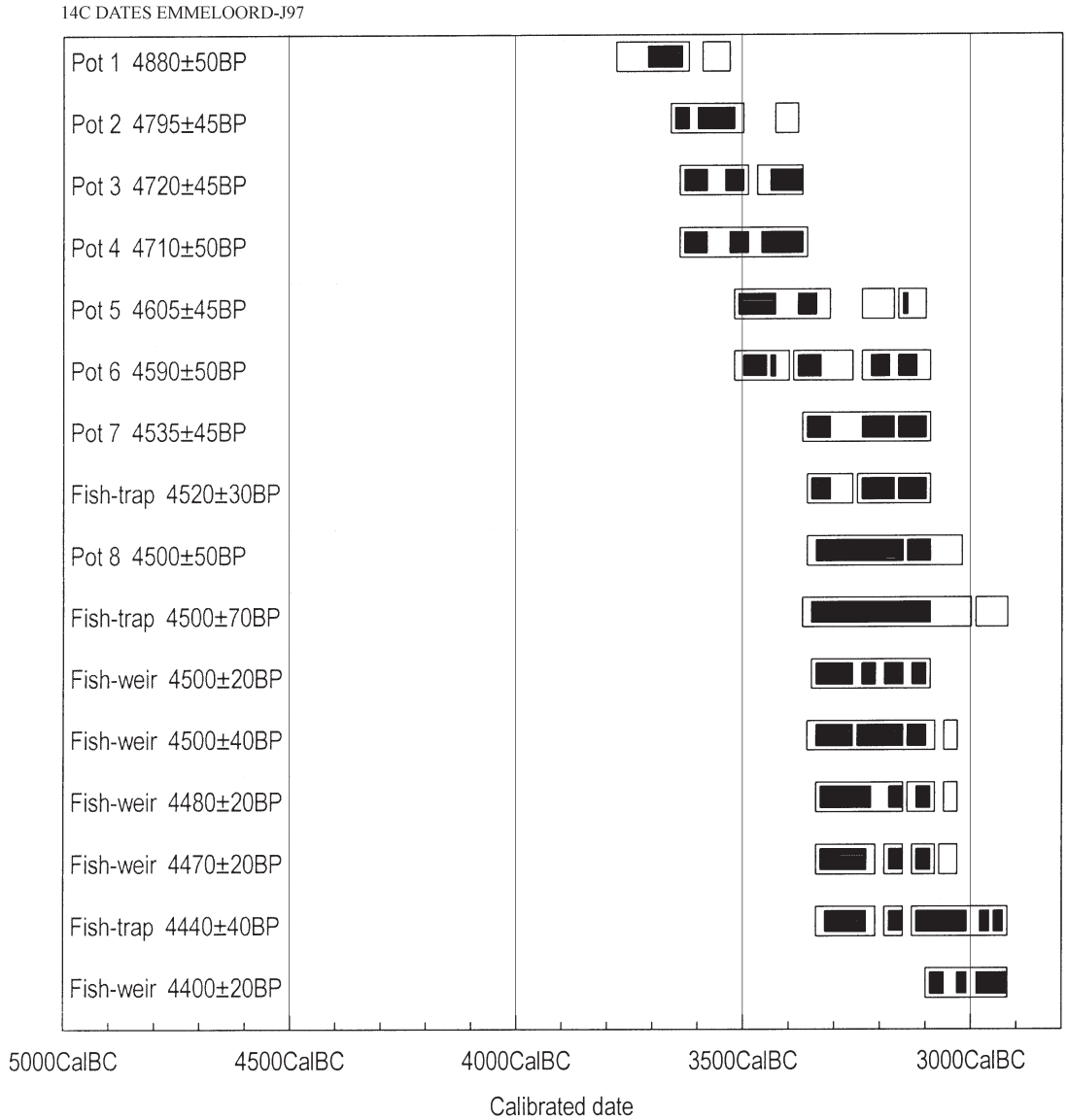

Fig. 7. ^{14}C dates from Emmeloord-J97.

- Emmeloord-pot 1. Biconical pot with a rim diameter of *c.* 31 cm with a large quantity of mica (temper?) and an average quantity of quartz temper;
- Emmeloord-pot 2. Barrel-shaped pot with a rim diameter of *c.* 22 cm with a large quantity of mica (temper?). Strip-building with H-joins;
- Emmeloord-pot 3. Biconical pot with a rim diameter of *c.* 38 cm with a large quantity of mica (temper?) and a small quantity of quartz temper;
- Emmeloord-pot 4. Biconical pot with a rim diameter of *c.* 20 cm tempered with small quantity of red granite;
- Emmeloord-pot 5. S-shaped pot with rim perforations (reminiscent of *Lochbückel* perforations) and rim diameter of *c.* 29 cm with no visible temper;
- Emmeloord-pot 6. Beaker with repair-hole and rim diameter of *c.* 26 cm tempered with small quantity of quartz;
- Emmeloord-pot 7. Biconical pot with rim perforations and repair-hole tempered with average quantity of red granite. Rim diameter of *c.* 34 cm;
- Emmeloord-pot 8. Shoulder fragment with a large quantity of mica (temper?) and small quantity of red granite. Strip-building with N-joins.

All pots are depicted in figure 6.

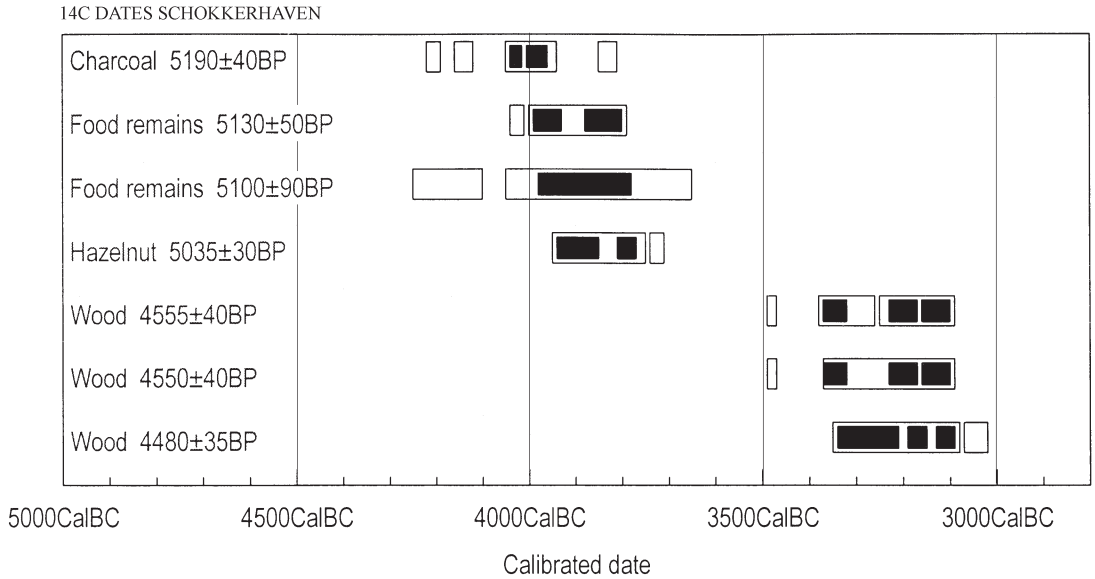

Fig. 8. ^{14}C dates from Schokkerhaven-E170.

The available dates on Emmeloord-J97 suggest that the reservoir effect may have resulted in dates that are too old (fig. 7 and table 3). The oldest dates fall within the Late Swifterbant range. Because the size of the ageing effect cannot be determined, the ^{14}C dates cannot be used to determine whether we are dealing with Late Swifterbant or TRB West Group pottery. The fact that the presented pots share strong stylistic and technologic similarities to the pottery from the Middle phase of the Swifterbant culture (section 7.2) and are quite different from what we know of TRB West Group pottery, suggests that we are in fact dealing with Late Swifterbant pottery. In that case, the reservoir effect might be varying between minimal (pot 8) and maximal 400 years (pot 1).

5. SCHOKKERHAVEN-E170

5.1. Introduction

The site was known from the 1960's when *a.o.* two Neolithic axes were collected. During the 1980's the ROB and the University of Amsterdam conducted further research including coring, test pits and small-scale excavations. The Amsterdam research in 1984 was published (Palarczyk, 1986; Hogestijn, 1990; Gehasse, 1995); the ROB research of 1988 received as yet little attention. In this article the focus is on the latter research.

5.2. Site description

The site is located on a river dune which is located in the valley of the river IJssel, which ran parallel to the river Vecht at a distance of some 5 km (fig. 2). The river dune reached up to *c*. 3.50 m –NAP and gradually drowned during the Holocene as a result of the rise of the groundwater level. From bottom to top a series of cover layers was recorded. The finds were recovered from these layers over a depth of *c.* one m. Palarczyk makes clear that the find zone extended some ten m from the slope. Coring reveals that it encloses the river dune for over a length of *c*. 100 m.

The occupation is dated to Late Swifterbant on the basis of several ^{14}C dates between *c*. 4000 and 3800 BC (fig. 8 and table 4). Some four to seven centuries later, during the period of the TRB Westgroup, a palisade was constructed. The wooden poles were driven

Table 4. The relevant ^{14}C dates from Schokkerhaven (after Lanting & Van der Plicht, 1999/2000).

Lab number	Archaeology	Date (BP)
GrN-14123	Charcoal	5190±40
mixed date	Food remains	5130±50
UtC-1085	Food remains	5100±90
GrN-14122	Hazelnut	5035±30
GrN-16708	Wood	4555±40
GrN-16709	Wood	4550±40
GrN-16710	Wood	4480±35

Table 5. Bone spectrum from Schokkerhaven-E170 (after Gehasse, 1995).

	n
Domestic/wild	
Cattle/aurochs (*Bos taurus/primigenus*)	7
Pig/wild boar (*Sus sp*.)	3
Wild	
Red deer (*Cervus elaphus*)	11
Beaver (*Castor fiber*)	3
Elk (*Alces alces*)	1
Horse (*Equus ferus caballus*)	1
Fox? (*Vulpes vulpes*)	2?
LM	13
MM	4
Mammal	72

through the Late Swifterbant find layers. TRB finds were not recovered from these layers but are present nearby. The mammal species found are listed in table 5. The limited number of identified bones prevents any conclusions other than the represented species were apparently available to the occupants (Gehasse, 1995). There is equally limited information on the plant food: there were grains from emmer wheat (*Triticum dicoccum*) and naked barley (*Hordeum vulgare* var. *nudum*) (Gehasse, 1995). The few dozen flint artefacts include scrapers, borers, trapezes and fragments of flint axes with oval cross-section. Flint working seems to have been carried out mostly using flake technology (Hogestijn, 1990).

5.3. Late Swifterbant pottery

The clear stratigraphical position and the available ^{14}C dates suggest that all Schokkerhaven pottery is of relevance here. The general description is based on the 1988 ROB excavation where 337 sherds with a minimum weight of 5.0 gram were recovered. The excavation trench had a length of 7 m extending from the slope of the river dune and a width of 2 m. All finds were collected in squares (1x1 m) and spits of 5 cm. The find layer seems to be divisible into two sub-layers on the basis of the spatial distribution of the sherds. These sub-layers might reflect two different occupation phases and were therefore studied separately. Table 6 makes clear that the differences between the two sub-layers are negligible. Moreover two similar lugs were found, one of which was present in each sub-layer (fig. 9).

The following general description of the 1988 pottery therefore includes all sherds. The sherds have an average wall-thickness of 9.0 mm. 92% of the sherds are tempered with grit material. Quartz is found in 67%, granite in 19% and only one sherd has both quartz and granite. Plant temper is found in 49% percent of the sherds, mostly combined with quartz or granite (39%). Average wall-thickness and tempering agents seem related. This suggests that pot size (reflected in wall-thickness) to some extent was predetermined when choosing tempering agents. Sherds with quartz temper have an average wall-thickness of 8.0 mm; granite-tempered sherds of 9.8 mm (plant-tempered sherds 9.4 mm). The pots were built with coiling technique using both the H-technique (82%) and the N-technique. Surface finishing techniques were difficult to determine due to the poor preservation. No sherds with polished surface were observed; most had a smooth or uneven surface. Rim decoration is present on two rim sherds (15%); these have a series of spatula impressions on the outside (fig. 9). Wall decoration is rare (1.5%) and carried out with paired (3x) or single (2x) fingertip impressions (fig. 9). The decoration probably covered the wall-surface. Two sherds have repair-holes. There are two lugs, probably from the same pot.

There are four larger pottery fragments to be discussed individually (fig. 9):

– Schokkerhaven-pot 1. Pot tempered with small quantity of quartz and large quantity of plant material. S-shaped pot with a rim diameter of *c*. 38 cm.

Table 6. Pottery characteristics from Schokkerhaven-E170 (1988 excavation).

			Temper %					decoration (n)	
	number	average wall-thickness	quartz	granite	plant	H-joins	N-joins	single fingertip	double fingertip
'Young'	162	9.0 mm	69.9	23.4	50.6	16	5	0	1
'Old'	158	8.9 mm	63.9	13.3	44.9	31	5	2	2
Total	337	9.0 mm	67.3	19.0	48.7	47	10	2	3

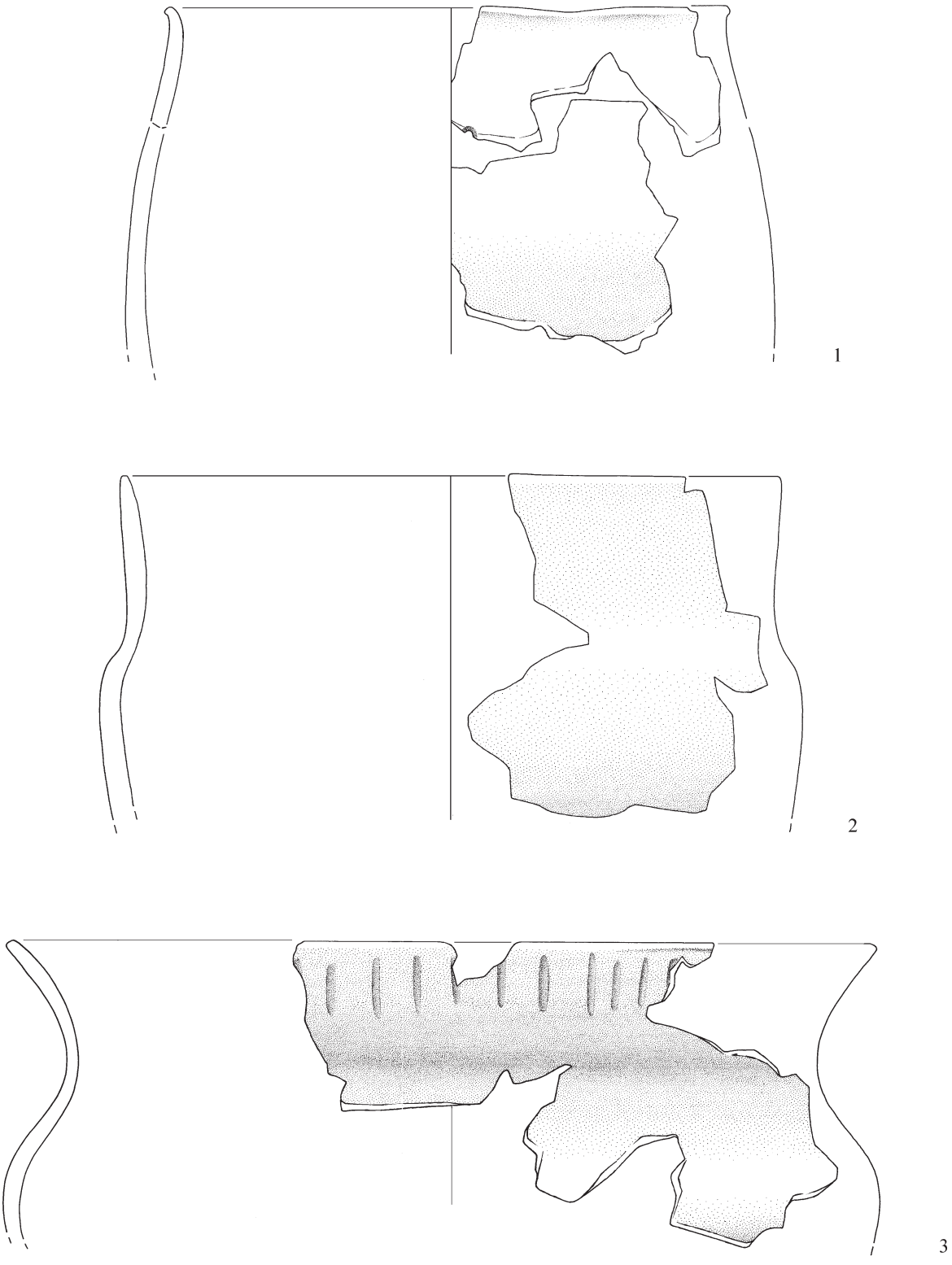

Fig. 9. Pottery from Schokkerhaven-E170.

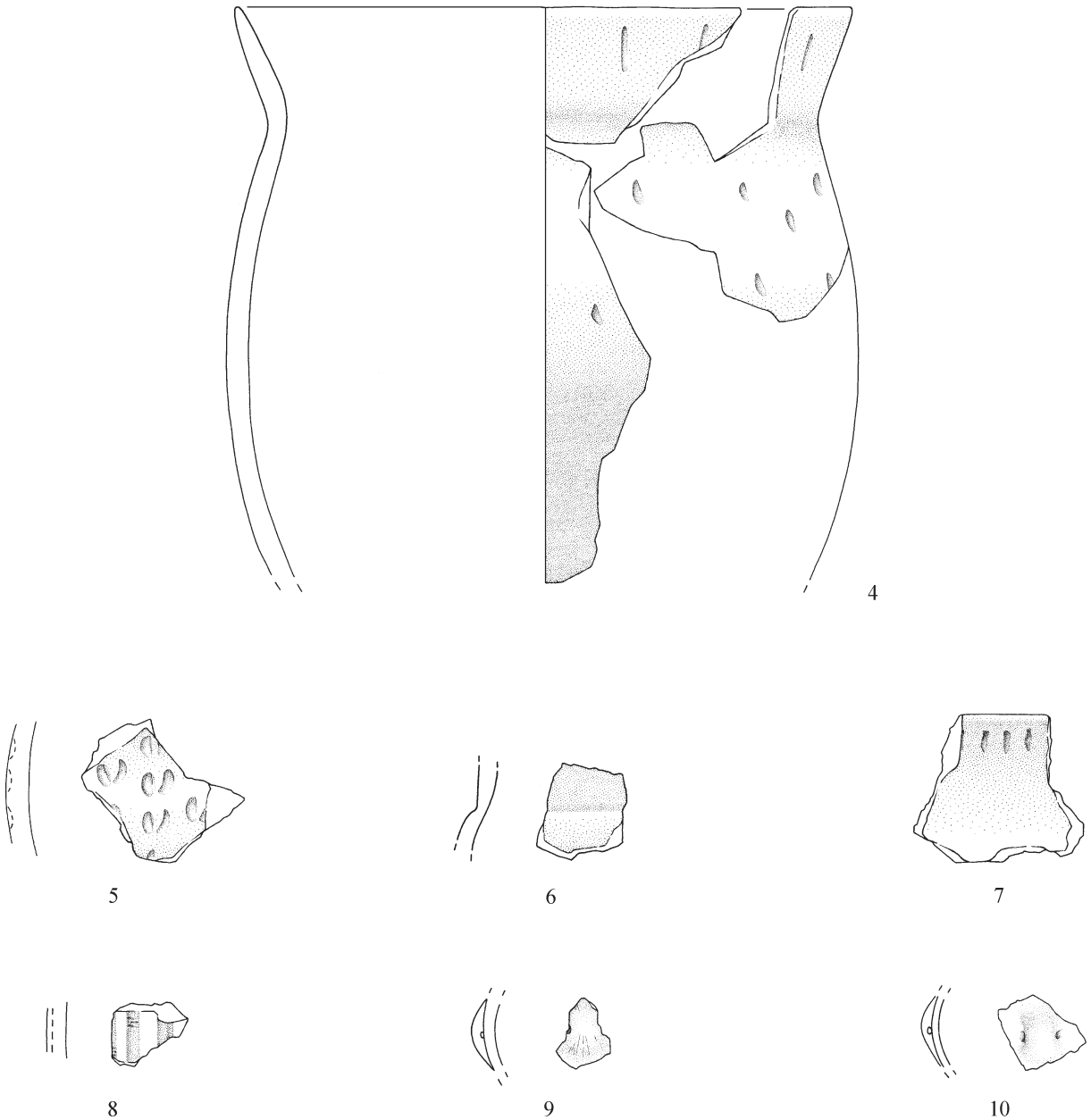

Fig. 9. *(cont.*)

The rim is decorated with a series of grooves with a length of *c*. 3 cm. 1984 research (Hogestijn, 1990: p. 4);
– Schokkerhaven-pot 2. Pot tempered with small quantity of quartz temper. S-shaped pot with uneven surface and a rim diameter of *c*. 24 cm. 1984 research (Hogestijn, 1990: p. 4);
– Schokkerhaven-pot 3. Pot tempered with medium quantity of quartz temper. S-shaped pot with smooth surface and a rim diameter of *c*. 34 cm. The rim is decorated with a series of grooves with a length of *c*. 2 cm. The wall-surface is decorated with a few spatula impressions. 1984 research (Hogestijn, 1990: p. 4);
– Schokkerhaven-pot 4. Pot tempered with a medium quantity of quartz temper and large quantity of plant material. Barrel-shaped pot with uneven surface and a rim diameter of *c*. 28 cm. 1988 excavation square 11, spits 8–9.

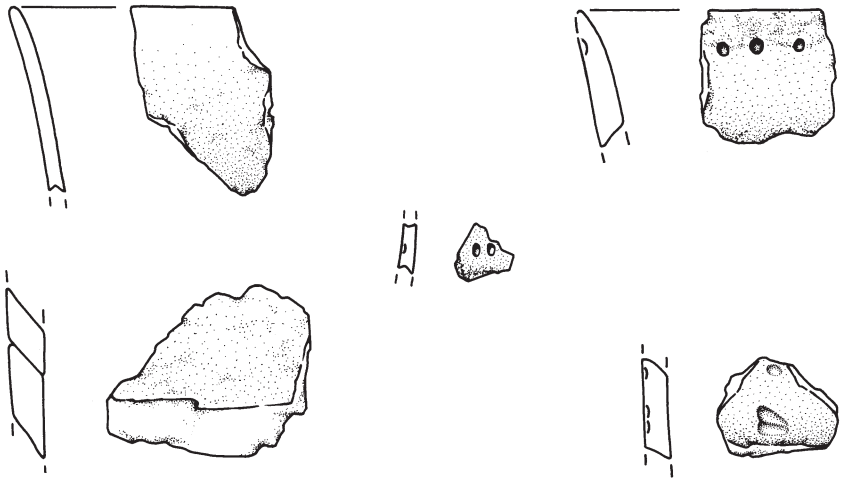

Fig. 10. Pottery from Wetsingermaar.

6. OTHER LATE SWIFTERBANT SITES IN THE NORTHERN NETHERLANDS

6.1. Schokland-P14

One of the major Late Swifterbant sites is certainly P14 (fig. 2). The site was discovered in 1957 and saw extensive excavations during the 1980's. These excavations were carried out by the University of Amsterdam. Reports on P14 include the natural landscape (Gotjé, 1993), the biological finds (Gehasse, 1995) and the Neolithic house plans (Ten Anscher, 2000/2001). A preliminary interpretation on the pottery and its significance for the discussion on the start of the TRB was published in 1993 (Ten Anscher, Gehasse & Bakker, 1993).

P14 is located on a Pleistocene boulder clay outcrop which bordered on the river Vecht. It is located some 5 km upstream from J97. Of special importance is trench 1987–17 in which the Holocene filling of the river Vecht was preserved. The Holocene find layers held Swifterbant and TRB pottery and seem to suggest a gradual transition from the former to the latter (see below). In 1993 P14 was considered to be a Late Swifterbant site. Later, ^{14}C dates made clear that the time depth involved was much longer and Swifterbant occupation started around 4900 BC to continue till *c*. 3300 BC. This new chronology is presented by Gehasse (1995) referring to Ten Anscher's dissertation (in prep.). While this study remains unavailable, a critique on the site's chronological resolution was presented by Lanting & Van der Plicht (1999/2000). Their analysis of the available ^{14}C dates makes clear that redeposition must have occurred and that the stratigraphy should be interpreted with great care. Furthermore, they question the TRB affinities of the presented pottery and suggest that these are characteristic not of earliest TRB but are to be seen as typical for the time period of Late Swifterbant. In this context they refer to similar finds from Hüde I (Lower Saxony: Kampffmeyer, 1991: for example Taf. 2: 297, Taf. 11: 1431) and Osterwick (Westphalia: Willms, 1982: Taf. 25).

The present situation is that there is an outdated interpretation of the site (Ten Anscher, Gehasse & Bakker, 1993), a new interpretation based on non-available evidence (cited in Gehasse, 1995) and a critique (Lanting & Van der Plicht, 1999/2000) on a not-published thesis (Ten Anscher, in prep.). The suitability of P14 for defining Late Swifterbant ceramics is therefore impossible to determine. There is no choice but to pursue the discussion without P14.

6.2. Other locations

Evidence of occupation in the period 3900–3400 BC in the northern Netherlands is limited and poorly published. The major sites were discussed above. Other sites with evidence of settlement are:

– Wetsingermaar (Feiken, 2001; Feiken, Niekus & Reinders, 2001). Settlement site with ^{14}C date of 4700±40 BP (GrA-16659). Association with archaeological remains is uncertain. The few sherds might be Late Swifterbant, but are too fragmented to allow certain identification (fig. 10);

– De Klokkenberg (Van der Hammen, 1965). A hearth with flint material and one sherd dated 4930±120 BP (GrN-4092);
– Gietsenveentje (Lanting & Van der Plicht, 1999/2000; Bakker, 2003). Pingo scar with evidence of forest clearance in pollen diagram. Clearance dated from *c*. 4050 BC. Lanting & Van der Plicht argue that this date may be too old as a result of the freshwater reservoir effect discussed in section 2;
– Buinerveen (Prummel & Van der Sanden, 1995). Find of a horn sheath of domestic cattle dated 4960±40 BP (GrN-20373);
– Westerbork (Prummel & Van der Sanden, 1995). Find of a horn sheath of domestic cattle dated 4880±60 BP (GrN-20384);
– Donkerbroek (Prummel, 2001). Find of a worked humerus of domestic cattle dated 4770±80 BP (GrA-12712).

7. SYNTHESIS

7.1. Late Swifterbant ceramics

The three discussed assemblages from the Noordoostpolder allow a general description of the Late Swifterbant pottery. The clay is mostly tempered with stone grit. This was preferably quartz, but in the case of Emmeloord and Schokkerhaven red granite was also used. Plant temper is also found in the Schokkerhaven pottery. The pots were built with coiling technique. This technique was carried out relatively good, judging from the small proportion of sherds with visible coil-breaks. Pot shapes are varied. There are S-shaped pots (both beakers with a somewhat similar height and width and vessels with longer heights) and closed forms (barrel-shaped pots and biconical pots). The pots have rim diameters between 20 and 38 cm. Decoration is found at Schokkerhaven and Emmeloord. At Schokkerhaven it consists of a series of spatula impressions on the shoulder or rim or groove lines on the neck zone. In one instance the wall-surface is sparsely decorated with spatula impressions. Emmeloord-pot 5 has *Lochbückel*-like decoration. A last detail is the presence of two small lugs at Schokkerhaven. The characteristics of pots 1–5 from Urk do not allow a certain attribution to Late Swifterbant.

7.2. A comparison with Middle Swifterbant ceramics

In many aspects the characteristics of the Late Swifterbant pottery can be derived from those from the preceding middle phase of the Swifterbant culture. De Roever (2004) provides a detailed description of the pottery from the levee sites at Swifterbant dating between 4300–4000 cal. BC. She describes the use of plant material as dominant temper, sometimes mixed with stone grit. Coils-building is attested on a percentage of sherds similar to the Late Swifterbant sherds discussed above (17%; Raemaekers, 1999: p. 47). S-shaped pots dominate the assemblage from the best-documented site, S3. Most pots are beakers and longer S-shaped types. Closed forms are absent there. Rim diameters vary between 11–37 cm. Decoration is more abundant and comprises different types, of which one or two series of spatula impressions on the shoulder and/or rim are the most important. Wall-surface covering decoration is found in small numbers and seems to indicate the last phase of occupation. A small number of lugs are also known from S3. One pot from Brandwijk has *Lochbückel*-like decoration (Raemaekers, 1999: fig. 3.9-5).

In most (technological, morphological, decorative) aspects the Late Swifterbant pottery fits in with the characteristics of the better-known middle phase. The characteristics that are typical for Late Swifterbant are mentioned here. First of all, the use of stone grit (quartz and red granite) as tempering agents as replacement of plant material. Second, there is the introduction of closed forms, most particular biconical pots. Third, decoration is clearly sparse in Late Swifterbant pottery, although the characteristics of the decoration can be found in the Middle Swifterbant decoration types. In all, the presented Late Swifterbant clearly fits in the Swifterbant pottery tradition.

7.3. A comparison with contemporaneous ceramics

A comparison with earliest TRB ceramics in northern Europe

What happened in southern Scandinavia, northern Germany and Poland at the time of Late Swifterbant in the northern Netherlands? The last decades saw a re-interpretation of the earliest TRB in Denmark and northern Germany and new regional groups were proposed. Lanting and Van der Plicht (1999/2000) suggest a threefold division of the Danish Early TRB on the basis of typological comparisons with finds from the Michelsberg culture and dismiss ^{14}C dates that contradict their argument. Their first phase consists of the Oxie group; their second phase relates to the Volling, Svaleklint and Stengade II/Siggeneben-Süd groups; their third phase equals late Volling, Virum and Fuchsberg. Their three phases are slightly different

from the twofold phasing presented earlier by Madsen (1994). He places Oxie alongside Volling, Svaleklint and Stengade II-Siggeneben Süd. It is important to realise that the dating problems prohibit a definitive solution. All these groups constitute regional pottery groups that are contemporary to Late Swifterbant.

In this overview, the well-documented bog pots from the Danish isles presented by Koch (1998) are used as point of reference for comparing the characteristics of beakers. It concerns Koch's types 0, I, II, III and IV. The pots are tempered with granite grit and coil-built. Typical is the use of N-joins (Koch, 1998: fig. 96). All five morphological groups concern beakers. Decoration consists of a series of spatula impressions on the shoulder and/or rim (types 0, I, II, III, IV), belly and neck zones with lines in stab-and-drag technique (types II, III, IV) groove lines on shoulder and/or rim (types IV; *Bauchfransen*). Some beakers have knobs or horizontally perforated lugs on the shoulder or neck. There are certainly similarities to the Late Swifterbant discussed above. These are the use of stone grit for temper, the beaker form and the use of spatula impressions and groove lines as decoration techniques and the presence of horizontally perforated lugs. These similarities seem little relevant when other aspects of the ceramic assemblages are taken into account. One element typical for Late Swifterbant, the biconical pots, is absent in earliest TRB, while a large number of TRB pottery forms are unknown from the Late Swifterbant assemblages presented here. These include bowls, flasks and clay discs.

A comparison with Hazendonk 3 ceramics

Along the rivers Meuse and Rhine, between Maastricht and The Hague, there is a series of sites of the Hazendonk 3 group. Their ceramic remains can be characterised as being preferably tempered with quartz grit (but also with other stone grit, grog, plant and shell) and coil-built (with a high proportion of sherds with visible coil-breaks). The pot shapes are beakers, buckets and barrels. On most sites, decoration is frequent. The decoration covers the wall-surface and is carried out as impressions with fingertips, spatulas or as groove lines (see Raemaekers, 1999: pp. 156–161 for a recent overview).

In general terms, the Hazendonk 3 pottery and the Late Swifterbant pottery have a similar 'feel': the technological characteristics (temper, coils, wall-thickness, firing circumstances) would allow many sherds to be attributed to either of the two groups.[4] The Hazendonk 3 barrels and buckets are rather dissimilar from the Late Swifterbant S-shaped pots and closed forms, as are the decoration schemes. One common aspect is the occurrence of beakers, a shape that also can be found in other groups such as the Michelsberg and TRB cultures.

8. CHRONOLOGICAL AND REGIONAL DEVELOPMENTS IN THE POTTERY OF THE SWIFTERBANT CULTURE

This study focuses on the as yet limited evidence on Late Swifterbant ceramics. In the latest overview an early, middle and late phase of the Swifterbant culture were proposed (Raemaekers, 1999). At the time, the early phase was defined mostly on the basis of preliminary publications. Now, three major assemblages are published and available for the construction of a more detailed framework of Swifterbant ceramics. In this framework chronological and regional developments can be outlined. The three phases defined in 1999 are upheld here. The early phase begins with the start of pottery production in Swifterbant style around 5000 BC. The middle phase starts around 4600 BC, although the centuries till 4300 BC are little known. Its pottery is characterized by a increase in plant temper and more frequent and varied rim decoration. The late phase starts around 3900–3800 BC and ends with the start of the TRB Westgroup around 3400–3300 BC. Late Swifterbant pottery sees the recurrence of grit as dominant type of temper and the lower frequency of decoration (Raemaekers, 1999: pp. 108–112).

This analysis is based on three groups of sites. These groups may be identified by referring to the river basins in which the sites are located. From north to south these groups are the IJssel/Vecht/Eem group, the Rhine/Meuse group and the Scheldt group.[5] Swifterbant occupation is attested for these three regional groups in the first centuries of the fifth millennium BC. In the Scheldt area, the Swifterbant occupation seems to be replaced before 4000 BC by Michelsberg occupation (Crombé *et al.,* 2002); in the Rhine/Meuse group the Hazendonk 3 group replaces the Swifterbant culture around 3800 BC, while in the IJssel/Vecht/Eem group the Swifterbant culture continues till around 3400–3300 BC to be replaced by the TRB Westgroup.

The pottery characteristics of the major sites are listed in table 7. The discussion here is based on these sites and the available data on the sites from the Scheldt group. The general trends are presented first. These define the ceramics of the Swifterbant culture in general. Most pots are S-shaped, although closed and bi-

Table 7. Characterization of the ceramics from the major Swifterbant sites Hoge vaart (Haanen & Hogestijn, 2001); Polderweg (Raemaekers, 2001a); De Bruin (Raemaekers, 2001b); S3 (De Roever, 2004; Raemaekers, 1999); Brandwijk (Raemaekers, 1999); Hazendonk (Raemaekers, 1999) and the Late Swifterbant presented in this study. All figures are percentages.

	De Bruin-phase 2	Polderweg	Hoge Vaart	De Bruin-phase 3	S3	Brandwijk L50 base	Brandwijk L50 top	Hazendonk 1	Hazendonk 2	Late Swifterbant
BC	5100-4800	5000	4900-4600	4700-4450	4300-4000	4200-4100	4000-3900	4000	3900-3800	
Pot forms										
Closed	no	yes	no	yes	yes	no	no	no	no	no
S-shaped	yes	yes	yes	dominant	dominant	yes	yes	yes	yes	yes
Biconical	no	no	no	yes	yes	no	no	no	no	yes
Base forms										
Round	yes	yes	yes	yes	yes	yes	yes	no	no	no
Point	yes	yes	no	dominant	yes	no	yes	no	no	no
Pointed	no	no	yes	no	yes	no	no	no	no	no
Rim decoration										
Percentage	54	44	33	40	58	8	17	36	0	15
Top	83	100	100	83	19	0	14	89	0	0
Outside	0	0	0	3	42	40	71	0	0	100
Inside	0	0	0	0	32	60	0	0	0	0
Multiple	0	0	0	3	4	0	14	11	0	0
Perforations	17	0	0	10	yes	0	0	0	0	yes
Wall decoration										
Percentage	0	7	0	1	8	18	20	12	5	2
On shoulder	0	yes	0	50	92	yes	yes	14	no	yes
Surface covering	no	?	0	50	8	dominant	dominant	86	100	yes
Knobs	yes	yes	yes	yes	yes	no	no	no	no	no
Lugs	no	no	no	no	yes	no	no	no	no	yes
Temper										
Grit	29	61	99	18	84	64	86	50	82	92
Plant	72	9	2	78	87	94	82	82	94	49

conical pots are found as well. Round and point bases are the general base forms. Rim decoration is frequent. Decoration on the top (*cf. Randkerbung*) is typical for the early phase but continues in lower frequencies till *c.* 3900–3800 BC. Decoration on the outside and inside are somewhat younger characteristics (starting at De Bruin-phase 3) and gaining in importance. Wall decoration is carried out in two distinct types: it covers the wall surface or it consists of one or a few series of parallel impressions on the shoulder zone. It is especially frequent in the middle phase. Knobs are typical for the early and middle phase. The pottery is mostly tempered with grit or plant material. The predominance of plant temper is typical for the middle phase (figs 11 and 12).

The Swifterbant culture has the longest duration in the area of the IJssel/Vecht and Eem-rivers (the province of Flevoland). The pottery from this area has characteristics that set it somewhat apart from the pottery from the two areas. These are the presence of pointed bases (Early and Middle Phase), the importance of rim decoration on the inside and wall decoration as one or a few series of parallel impressions on the shoulder zone (both Middle Phase), the occurrence of lugs (the Middle and Late Phase) and the continuous importance of grit temper. In contrast

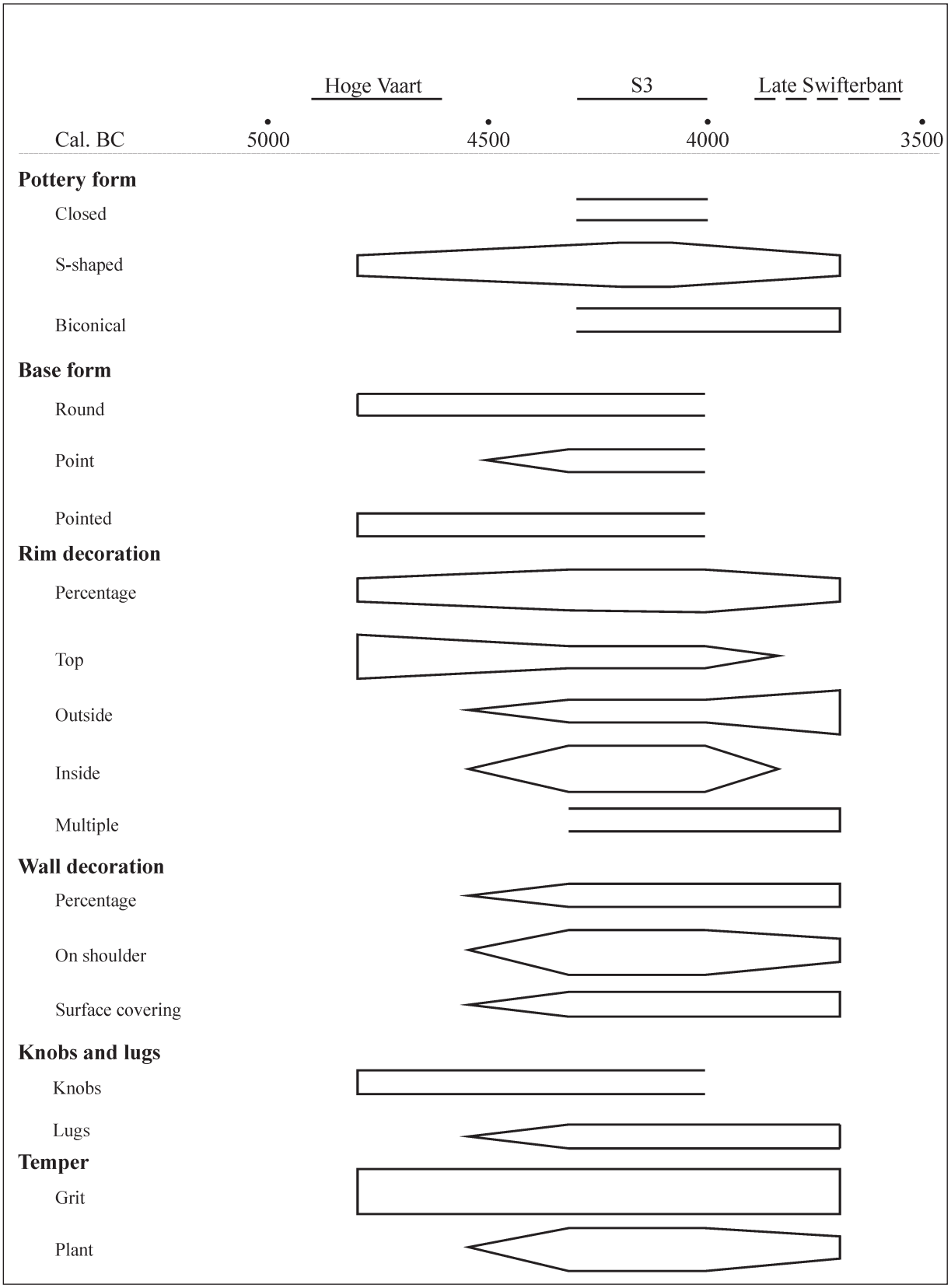

Fig. 11. The chronological development of the Swifterbant pottery in the IJsel/Vecht/Eem area.

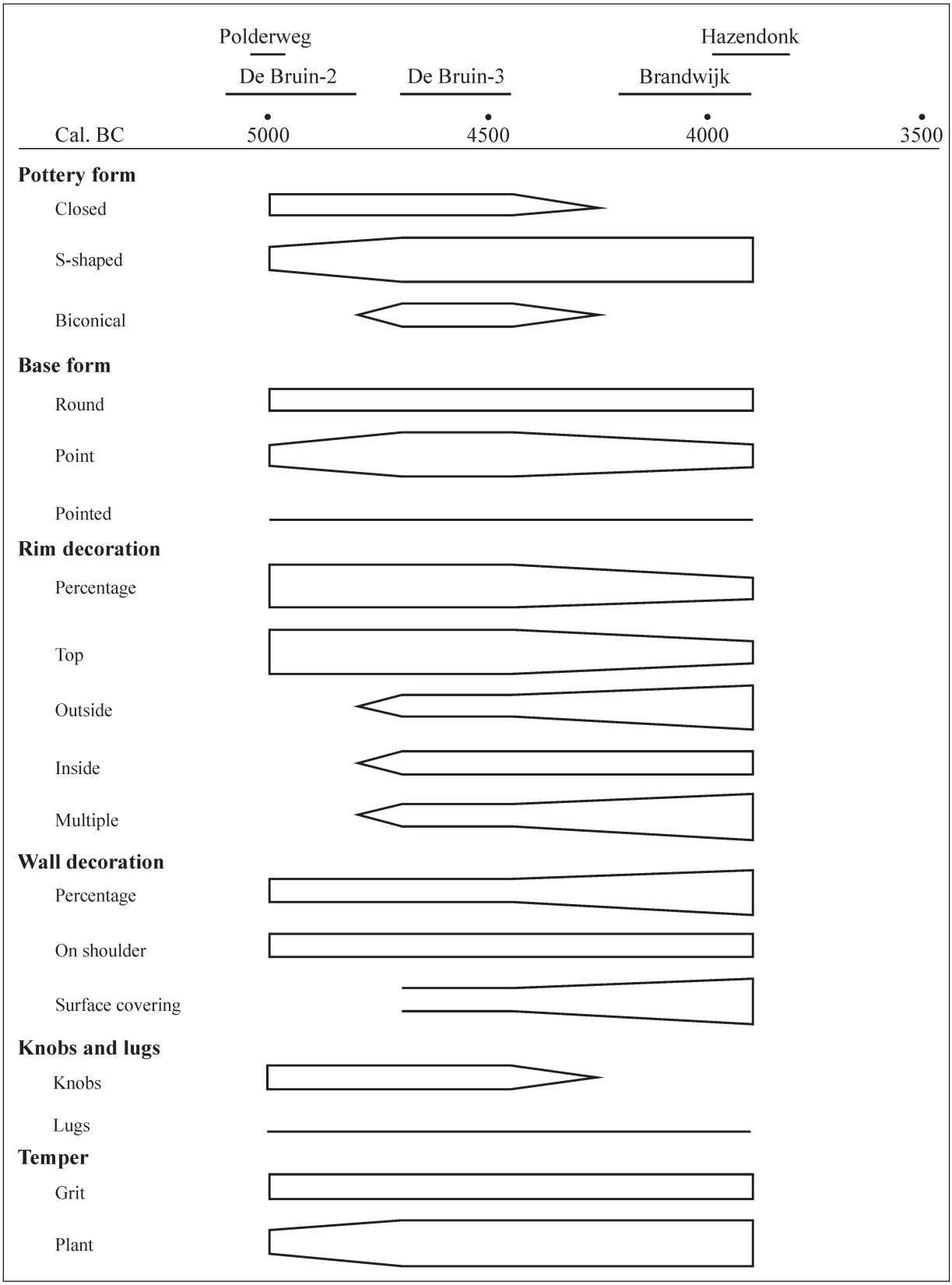

Fig. 12. The chronological development of the Swifterbant pottery in the Rhine/Meuse area.

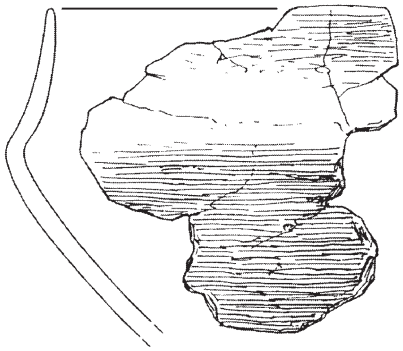

Fig. 13. Pottery from Swifterbant-S61 (After De Roever, 2004: fig. 24a).

the Rhine/Meuse group is characterised by the absence of pointed bases, the early start of wall decoration (around 5000 BC), the importance of wall surface covering decoration (Middle Phase), the absence of lugs and the continuous importance of plant temper. In the Scheldt group evidence is limited but suggests again different traits. These are the importance of grog temper, the presence of rim perforations and the near absence of wall decoration (Bats *et al.,* 2003; Crombé *et al.,* 2002; 2004).

9. CONCLUSIONS

In this article Late Swifterbant ceramics were presented. The ceramic finds presented here are closely related to the older Swifterbant pottery of the Middle Phase. Strong ties are found in technology, morphology and decoration. A new element in the Late Swifterbant pottery is the presence of biconical pots. At the moment, these may be seen as guide fossils for Late Swifterbant pottery. If this is true, a major part of the ceramic finds from the river dune site S61 might also be interpreted as Late Swifterbant (De Roever, 2004: pp. 65–67; see fig. 13). Not only do the drawings indicate the presence of biconical pots; De Roever's description of the sherd characteristics (stone grit temper, coil-building, decoration types) is all reminiscent of the Late Swifterbant ceramics presented here.

The short comparison with contemporary *earliest TRB* and Hazendonk 3 ceramics makes clear that in this time period, the beaker is a cultural trait found in a large area and beyond cultural boundaries. This form is dominant in early TRB culture, seems widely available in Late Swifterbant assemblages, but is also found (albeit in smaller numbers) in Hazendonk 3 contexts (and beyond). It is interesting to note that the decorative schemes found on beakers in the Late Swifterbant contexts are a subset of the large variety of schemes available on TRB beakers while the Hazendonk 3 beakers are undecorated. In other words, decorative schemes decrease when travelling from north to south. Leaving the beakers behind, one can see that Hazendonk 3 pots differ from Late Swifterbant ones both in morphology and decorative schemes.

Thanks to new research on the ceramics from both the early and late phase of the Swifterbant culture it is now possible to present a coherent scheme on the chronological developments and its regional variation. It appears that the pottery from the three regional groups all have a distinct character. Moreover, the time-depth of Swifterbant occupation differs considerably. The Scheldt group is comparatively short-lived and is in geographical terms replaced by the Belgian Michelsberg culture. The Rhine/Meuse group continues till 3900–3800 BC to be replaced by the Hazendonk 3 group of which the pottery is reminiscent of Swifterbant pottery in terms of quality, technology, wall surface decoration and the occurrence of beakers. In the (northern part of the?) province of Flevoland, the IJssel/Vecht/Eem-area, the Swifterbant traditions continues till 3400–3300 BC.

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11. NOTES

1. This problem is of relevance for the site Zeewolde-OZ32 (unpublished). The ceramic and flint finds indicate a Neolithic age. There was little organic material available for study. One hazelnut shell was dated yielding a result in the Roman period (GrA-23262: 1805±40 BP). This is probably the first Roman date in the province of Flevoland. The site was located on a cover sand ridge near a small stream. During the Roman period the area was a large swamp, probably cross-cut with several small streams. Perhaps one of these streams followed the Neolithic stream.
2. Pot 4 from Urk-E4 is dated by means of its charcoal temper.
3. This regional curve is largely identical to the regional curve for the southern part of the province of Flevoland (Peeters *et al*., 2002). This underlines the relevance of the Gotjé curve for determining a *terminus ante quem*.
4. At the same time that I conducted the analysis presented here, I worked on the Hazendonk 3 ceramics from the site Schipluiden-Harnaschpolder (Raemaekers & Rooke in prep.). In this way, the Hazendonk 3 sherds and Late Swifterbant sherds could be compared in great detail.
5. In Raemaekers 1999, the IJssel/Vecht/Eem group is called northern group; the Rhine/Meuse group is called southern group. At the time, no Swifterbant sites from the Scheldt-area were known.

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